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tween horses and the storage-battery, including every thing but the deterioration of the battery, is from one to three dollars per car per day in favor of the battery. Taking a well-known form of battery as a type, supposing fifty per cent over the cost of manufacture is charged for the cells, and estimating the cost of horse-power for one of the New York street-railways: the difference of cost of the two systems is roughly two dollars and a half per car per day. Now, whether the repairs of the battery will cost this much is a matter that only experience can settle, but on roads where the grades are slight it is very probable that the batteries will be most economical.

The matter at present stands thus: only about fourteen per cent of the possible storage capacity of storage-cells is utilized; their discharge rate is limited, so that even this comparatively small capacity is great in comparison to it; the cells deteriorate, so that a large item of expense is in repairs; the efficiency of the cells is not greater than seventy per cent. Even with these disadvantages, storage-batteries can be largely applied for lighting and traction-work. It seems impossible, with the number of investigators working on the subject and the great possibility of improvement, that the next few years will not see a great increase in the economy, storage capacity, and discharge rate of storage-cells; and a very moderate increase in any of these, especially the latter, will throw the balance decidedly in their favor for traction-work. For lighting, their field is equally extended.

PRIMARY AND SECONDARY CURRENTS IN INDUCTION-COILS.—The relations between the primary and the induced secondary currents in induction-coils have been investigated mathematically by several writers, the clearest and most satisfactory treatment being probably that of Mascart and Joubert. Since the experiments of Ewing on the magnetization of iron, it has been clear, not only that the assumptions hitherto made have not accurately represented the facts, but that any rigorous mathematical treatment would, with our present knowledge, be impossible. The work of Prof. Galileo Ferraris in this connection is important as showing the extent of the modification that can take place. He has determined experimentally the difference of phase between the primary and secondary currents in an old-type Gaulard and Gibbs transformer, and, comparing them with theoretical deductions of his own, finds the agreement satisfactory. The objections to his work seem to be that the apparatus he experimented on is obsolete, and is not of the type at present universally used; the old transformers having an open magnetic circuit, while now the magnetic circuit is always closed. The work is important, however, as showing the inadequacy of the at present accepted treatment.

ETHNOLOGY.

Notes on the Kwakiul of Vancouver Island.

DR. GEORGE M. DAWSON gives in the Transactions of the Royal Society of Canada for 1887 a very interesting sketch of the Kwakiul, a people inhabiting the central part of the coast of British Columbia. He describes the numerous tribes of this nation and their several villages, but the most interesting part of the paper is a description of their mode of life, traditions, and language. They live in large wooden houses, the front of which is painted with designs representing the fabulous thunder-bird, whales, snakes, or salmon, while the posts and beams supporting the roof are carved in similar forms. The children are for a long time kept tied into the cradle. When they leave it, the cradle and the bedding must be deposited at a place reserved for this purpose. Then a great festival is celebrated, and the child is given a name. On this occasion the father has to give away a great part of his property. Dawson gives very valuable information on this giving-away of property, which was well known to be practised by the tribes of the north-west coast, but the meaning of which was not clearly understood. He says,—

"The rules governing the *potlatch* (as this festival is called in the Chinook jargon) and its attendant ceremonies have grown to be so complicated that even those persons most familiar with the natives can scarcely follow it in all its details, and it is sometimes difficult for the natives themselves to decide certain points. The custom was formerly almost entirely confined to the recognized chiefs, but of late years it has extended to the people generally, and become very

much commoner than before. It is regarded as a means of acquiring and maintaining prestige and power, but it has nowadays spread to all classes of the community, and become the recognized mode of attaining social rank and respect.

"As a particular instance of the custom, let us suppose that a man of one tribe has collected together as his own, or obtained control of, say, five hundred blankets, and wishes to make a *potlatch* to some other tribe. He goes to its village, and makes known his intention of distributing a thousand blankets at a certain date. He begins by lending out his stock of five hundred blankets, giving larger numbers to those who are well off. This loan is reckoned a debt of honor, to be paid, with interest, at the proper time. It is usual to return two blankets for every one borrowed. Thus the stranger obtains the thousand blankets for his *potlatch*, which, with the accompaniment of much bombastic speech-making and excitement, are distributed in exact proportion to the social position of those taking part."

Those who receive presents at such a festival become debtors of the man who gives the feast. These feasts are celebrated at a marriage ceremony or when a man wishes to take a new name.

In connection with the remarks on the *potlatch*, Dawson refers to the actual condition of this people, and emphasizes the fact that the best way to civilize them will be the establishment of industries among them. The report on the legends of the people is of great interest, and so is the vocabulary of about seven hundred words, which is of great importance, as our knowledge of that language is very scanty.

BOOK-REVIEWS.

Great Waterfalls, Cataracts, and Geysers. By JOHN GIBSON. New York, T. Nelson & Sons. 16°. \$1.25.

Chips from the Earth's Crust. By JOHN GIBSON. New York, T. Nelson & Sons. 16°. \$1.25.

THESE two publications present in a readable form certain phenomena of physical geography; the former treating of famous cataracts and geysers, the latter with a variety of geological phenomena such as obtrude themselves upon the attention of the reading public. The book on waterfalls and geysers is well illustrated, and the author has described almost exclusively those cataracts of which he was able to give an illustration. The papers of which the 'Chips from the Earth's Crust' consist were originally contributions to the *Scotsman* newspaper. Eruptions of volcanoes, great land-slides, tornadoes, discoveries of new gold-fields, the fall of a meteor, earthquakes, and similar phenomena, have given occasion to writing these papers; and we think the author has well accomplished his task to write in an agreeable form to such people as have no time and occasion for systematic study, but want to know what has been discovered regarding the history of the earth and the cause and true character of current geological events. The book contains a considerable number of illustrations.

Mineral Resources of the United States. By DAVID T. DAY. Washington, Government. 8°.

THE annual report on the mineral resources of the United States for the year 1886, compiled in the Division of Mining Statistics and Technology of the United States Geological Survey, has just been issued. We find in this volume, which is the fourth of the series, a minute and exhaustive report on the production and economic value of minerals in the United States. The arrangement is according to materials, and under each heading the total production, recently opened mines, technical improvements, imports and exports, are treated. The statistical tables of the preceding volumes have been brought forward to the close of 1886. Besides the report on the annual production, the volume contains a brief and interesting review on the American iron industry, from its beginning in 1619 to 1886, by James M. Swank, and an elaborate paper on the iron ores east of the Mississippi River, by John Birkinbine, to which are added analyses of foreign iron ores smelted in this country. The volume is very exhaustive, not only treating of metals, coal, petroleum, etc., but giving also a review of the production of structural materials, fertilizers, precious stones (the last by George F. Kunz); in short, of all minerals of any economic value.